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accumulating water. But it is difficult, not to say impossible, to believe that these forces would be adequate to the production of any such results as he supposes. The total amount of displacement which could result from them could be only a few feet.

Combined with the theory of moderate oscillations in the earth's crust at the proper places, Captain Taber's views are helpful in appreciating the effect of the ocean currents in so distributing heat and moisture as to produce glacial conditions both in the southern and northern hemisphere. But, unless he admits these changes of land level, we see little force in his arguments, and consequently his prognostication of a coming ice age is without any scientific basis.

G. FREDERICK WRIGHT.

Researches upon the Antiquity of Man in the Delaware Valley and the Eastern United States. By HENRY C. MERCER. Ginn & Co., Boston. 1897. 8vo. Illustrated. Pp. 178.

This volume is one of the series in 'philology, literature and archaeology' published by the University of Pennsylvania. They are not intended to be 'popular,' but to convey the products of original research work. Such is the character of the present number. It is a plain and careful description of a series of studies conducted in the last few years, with the object of finding out whether there is sufficient evidence in the locality selected to assert that man lived there in the glacial or early post-glacial period.

Such assertions have been and are confidently advanced by several prominent American archaeologists, especially with reference to the exhumation of chipped stones from the glacial gravels at and near Trenton, New Jersey.

On this particular point Mr. Mercer's personal researches are negative. His repeated examinations of the Trenton grounds 'failed to reveal a specimen in place' (p. 32); the caves he examined along the Delaware river contained nothing of man's handiwork which pointed elsewhere than to the Indian as we know him; and the so-called 'turtle backs' of argillite, found in the Trenton gravels, were probably 'intruded by modern Indians' (p.

60); and, finally nothing was found 'to corroborate the alleged antiquity of the chipped blades from Trenton,' and not a little to weaken it (p. 85).

These results, though in a measure negative, leave the supporters of the 'glacial man' theory at Trenton, with a large fraction of their argument exploded, since much has been made of the 'argillite implements' as proving antiquity. Now we know that whole quarries of argillite were worked by the modern Indian.

Other essays in the volume describe the exploration of an Indian ossuary on the Choptank River, Maryland, with a description of the physical characters of the bones by Professor Cope, and a discussion of their diseased (probably syphilitic) conditions by Dr. R. H. Harte; investigations by Mr. Mercer in an aboriginal shell heap on York River, Maine, in which traces of cannibalism were discovered; and excavations at the 'Indian house' and at Durham Cave, by the author. Among other interesting facts which Mr. Mercer has been enabled to substantiate by those studies is that in long post-glacial times the peccary, the tapir, the mastodon and the fossil sloth (*Megalonyx*) roamed the forests of the eastern United States. This, however, 'refers to an epoch in the past removed by many milleniums from the discovery of America' (p. 175), in the author's opinion.

The earlier pages of the volume recite several important investigations of the author in the 'quaternary' deposits of France and Spain. These gave him an excellent standard of comparison in his American work and the thoroughly scientific manner in which he carried it out is visible on every page.

There are a number of accurate and well-taken illustrations of localities and specimens, and the notes will aid the student in gaining access to the literature of the subject. It is to be regretted that no index was prepared.

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SCIENTIFIC JOURNALS.

PHYSICAL REVIEW, MARCH-APRIL.

The Lead Cell: By B. E. MOORE. The extension of the theory of free ions, solution ten-

sion and osmotic pressure to the lead cell was first made by Le Blanc. This theory is farther developed in the article. The number of tetravalent lead ions at the positive plate of a charged lead cell is very small. When a current is taken from the cell, PbSO_4 is formed when the point of saturation of bivalent lead ions is reached. If the formation of such a product involves time, a supersaturation of bivalent ions would rapidly follow. This is especially true if the current is large. Upon the Nernst theory this would produce a rapid fall in the electro-motive-force of the cell, until equilibrium is produced, *i. e.*, until the rate of precipitation of the lead sulphate is equal to its rate of formation. In the charging process there would be a corresponding diminution in the products of ionization, and the charging electro-motive-force must rapidly rise above the normal electro-motive-force of the cell. Experiment confirms these deductions from the Nernst theory, and shows that these initial changes take place largely within the first two minutes after closing, or after opening the circuit. Debarring this initial change in the cell, which causes large losses in energy, the curve of the electro-motive-force of the cell is shown to agree through a wide range with changes in electro-motive-force brought about by progressive changes both in the solution tension of the electrode and in the pressure of the ions. It is shown that Planck's thermodynamic treatment leads to the same deductions.

On the Influence of Electrification upon Surface Tension of Water: By E. L. NICHOLS and J. A. CLARK. In this paper an attempt was made to determine by quantitative measurements the change in the surface tension of liquids to which the well-known effect of electrification upon water jets, etc., is due. The method pursued was that of the water dropper. A reservoir from which the water drops proceeded was kept charged by the continuous action of a Holtz machine driven by an electric motor. A large battery of Leyden jars furnished the circuit with sufficient capacity to prevent rapid fluctuations of potential.

The electrification of the reservoir was measured by means of a form of an absolute electrometer; the temperature of the falling drops by

means of a thermo-electric junction. The range of potentials was from zero to 11,000 volts. Beyond the latter value measurements became impossible because drops were no longer formed. The result of these measurements indicates that the surface tension falls off at first slowly, and then more and more rapidly as the potential rises, until at 10,000 volts it has been reduced to about one-half its value for the electrified liquid. No difference could be detected between the action of positive and negative charges.

On the Mechanical Conceptions of Electricity and Magnetism: By W. S. FRANKLIN. This paper develops detailed mechanical conceptions of various electro-magnetic phenomena, based upon the fundamental conceptions of Maxwell, with particular reference to the quantitative relations which hold among the various electro-magnetic quantities. Among other things, a minute description is given of the action which takes place in the region surrounding a Hertz oscillator.

On a Possible Development of the Idiostatic Electrometer: By C. BARUS. The idiostatic electrometer has not hitherto been developed to an extent comparable with the quadrant electrometer; yet it possesses the advantage that it introduces no foreign potentials to cooperate with those under investigation. The writer describes certain results obtained in an endeavor to perfect the idiostatic electrometer. The moving system was supported by a double bifilar suspension. The disc was made very light and protected by a guard ring. The excursions of the disk were observed by Michelson's refractometer. Thus in one case ten fringes passed for a single volt; estimating 0.1 fringe the sensitiveness thus became 0.01 volt.

Empirical Formulæ for Viscosity as a Function of Temperature: By A. WILMER DUFF. Several formulæ for the viscosity of liquids at different temperatures have been proposed. The writer classifies and discusses these and considers means of interpolation and extrapolation.

A synchronous Motor for Determining the Frequency of an Alternating Current: By GEORGE S. MOLER. This paper describes an exceed-

ingly neat instrument for determining the frequency of an alternating current. A small synchronous motor is connected through a train of gears to a dial which indicates the frequency direct. The apparatus is small and portable, the base being 14 inches long and the total weight being 8.5 pounds. It may be operated from a 16 candle-power lamp socket.

Lecture-Room Demonstration of Orbits of Bodies Under the Action of a Central Attraction: By R. W. WOOD. The apparatus consists of an electro-magnet with a conical pole piece projecting through a horizontal glass plate covered with lampblack. A bicycle ball is shot out upon this plate; its path is traced and a permanent record of its motion is thus obtained. Various orbits were thus determined.

The Refractory Index of Water and Alcohol for Alcohol and Electrical Waves: By A. D. COLE. This short note calls attention to the fact that the writer in a previous paper had not ignored the absorption of the Medium.

NEW BOOKS: *Higher Mathematics*, Merriman and Woodward; *A Primer of Quaternions*, Hathaway; *Alternating-Current Machinery*, D. C. and T. C. Jackson; *Transformers for Single and Multiphase Circuits*, Kapp; *Méthode et principes des sciences naturelles*, Brentano; *Elements of Electro-Chemistry*, Le Blanc; *Motive Power and Gearing for Electrical Machinery*, Carter; *Mathematical Papers read at the International Mathematical Congress, Chicago, 1893*; *Laboratory Manual of Inorganic Chemistry*, Williams; *Chemistry at a Glance*, Tuttle; *Inorganic Chemical Preparations*; *The American Annual of Photography*, Thorp; *Problems and Questions in Physics*, Matthews and Shearer.

AMERICAN GEOLOGIST, MARCH.

O. W. CROSBY and M. L. FULLER present the results of their investigation as to the 'Origin of Pegmatite,' or giant granite. The intimate association and evident close connection of pegmatite with undoubted plutonic rocks, and their agreement with the latter in composition and relations to the inclosing formations, have led many writers to regard the pegmatite itself as of plutonic igneous origin. It is also not long since geologists were united in the conviction that these were true vein rocks,

due to the deposition of the various component minerals from solution in open fissures or other preexisting cavities. Now, however, a decided drift in the opposite direction may again be noted, and recent literature indicates an approaching agreement in favor of the association of the pegmatites, in their genetic relations, with plutonic igneous rocks rather than with subterranean aqueous deposits. The authors conclude that the magma of pegmatite may be formed by normal magmatic differentiation in a boss, or large body of magma, both crystallization and the operation of different temperatures in various parts of the mass tending to increase the degree of hydration of the residuum about favorable centers. These magma residues may crystallize *in situ*, in the midst of the previously solidified normal granite, or they may suffer extravasation and crystallize in spaces in the parent rock or in the surrounding formations. Also, apophyses of the normal granite magma may invade highly heated, water-bearing formations, such as schists, and experience the necessary hydration for conversion into pegmatite magma.

The correlation papers on 'The Galena and Maquoketa Series,' by F. W. Sardeson, end with this number. The basis employed has not been the usual one of computation of percentages among the various beds, but the limits, range, distribution and variation of the commonest species has been taken.

'Evidence of Glaciation in Labrador and Baffin Land,' by R. S. Tarr. All of the land, excepting possibly the highest parts, has been buried beneath an ice sheet. The glacial action produced more effect in the down-cutting of the surface in Labrador than in Baffin Land, and there is evidence that the ice has withdrawn from these regions in very recent times. Ice erosion has been greater in New England than in the northern region. On the other hand, proceeding northward, the effects of post-glacial weathering become progressively pronounced, so that the recency of the ice uncovering is more and more marked.

O. H. Hershey has the first installment of a paper on 'Esker's indicating stages of glacial recession in the Kansan epoch in Northern Illinois.'